

Impact of IoT-Based Smart Cities on Human Daily Life



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1 Introduction

Since the dawn of man, human beings have shown huge interest in living in groups. This group evolved from couples to tribes, from tribes to villages, from villages to cities; but why? Studies have shown that people feel safe when they are in groups. Nowadays, people prefer living in the cities. According to a UN study in 2016, the statistics show that 54.5% of the total populace currently live in urban areas. In addition, the UN anticipates that by 2030, 60% of the total populace will live in modern cities [1]. Thus, what we can conclude from that is individuals will live in urban areas; now, the question is, are these cities ready for that? Some cities barely handle the number of people they already have as illustrated by traffic problems, health problems, security problems, and housing problems. Therefore, cities must solve these problems before more people inhabit them! One of the presented solutions is called a Smart City. Therefore, this chapter will analyze the problems and advantages in modern cities and the reasons why we need Smart Cities. In addition, the chapter will define and analyze the concept of Smart Cities, showing how the IoT is an important factor, critique the existing model—IBM's—highlight the

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advantage of Smart Cities, and try to present new solutions for the disadvantages. Moreover, since the Internet of Things (IoT) is presently getting to be a one-on-one promising technology in this world, big data analysis is becoming a powerful tool to be used to build a Smart City.

2 The Modern City

Today, the cities of the world face various challenges, including job opportunity, economic growth development, ecological supportability, and social versatility. Emanations and pollutants from car engines have turned into a noteworthy well-structured contamination in huge and medium-sized world urban areas. Numerous substantial urban communities experience authentic air pollution and ozone damaging substance radiation, which is aggravated by growing development. Considering these challenges, the European Association and various countries are placing assets into ICT research and progression toward making methodologies to upgrade the individual fulfillment of locals and the practicality of urban networks. Of the human population, 54.5% of us live in Modern cities. However, it varies from one region to another. The following basic factors lead a city to be called Modern:

Health Centers Specifically, easy access to hospitals and clinics for everyone in the city.

Transportation It is the vein that runs any city, without it, the city will be paralyzed and messy, and people will depend more on cars since there is no public transportation.

Investment Job opportunities; we can say it is the most important factor in this list, because we can say that health centers are investments, and we can say the same thing for transportation too. Also, it is the reason why people move from villages to cities and from one country to another. More investment equals more jobs; also note that investment is nothing without security, which is our next point.

Security The factor that holds everything together. The first thing anyone who wants to move to a new place thinks about is safety and security. Without it investments will decline as no one wants to invest in a troubled place.

2.1 Problems in Modern Cities

Human factor This is the most significant problem in Modern Cities. While not all humans have a bad influence on cities, here, the meaning refers to how dependent on humans cities are, in every detail. People need to be trained, and most importantly, they need professional ethics in order to eliminate behaviors such as long lunch breaks, piling paperwork, and missing deadlines. All these reasons make some cities

slower and slower, thus becoming inefficient. Moreover, humans can only work for a limited time such that if there is a problem at night, hopefully, it will be fixed the following morning. Therefore, automating some tasks such as driving will save a lot of our resources.

Human–Machine interaction People in Modern Cities are not used to having a lot of interaction with machines, except for simple machines such as parking lot meters and ATMs. Everything else is human–human interaction, and that wastes a lot of time. Humans should automate routine tasks. That is a very huge disadvantage to this model.

Thus, to solve these problems, people came up with a model called the Smart City. Next, we will define it, introduce a famous model, then critique it, but first we will explain the backbone of the Smart City [2].

3 IoT – The Backbone

The IoT can be characterized as the tremendous interconnection of smart gadgets. This concept is applied from small sensors to large vehicles. Some people consider the IoT as the fourth generation of computers, and that is how important IoT systems are. Many people use them every day, without even knowing. If you want to know whether you use the IoT or not, let us break down its name and definition, “The expanding interconnection of smart devices”. Thus, it is the connection or a communication among smart devices. Or rather, from its name Internet of Things, as internet—communication or interconnection—of things such as smart devices [3]. The IoT has helped society and businesses around the globe uniquely unlock new and immense chances to access volumes of information and present new and distinctive applications and administrations to make a superior future for the urban community, diminishing force utilization, and enhancing productivity of the general public.

3.1 *Role of the IoT in Smart Cities*

The IoT is all related in one way or another to communication among different devices in different places [4]. The IoT is going to play an important defined role in every field of industry and daily life activities. Let us take Smart Housing and Smart Vehicles as an example to explain the role of the IoT in development of Smart Cities.

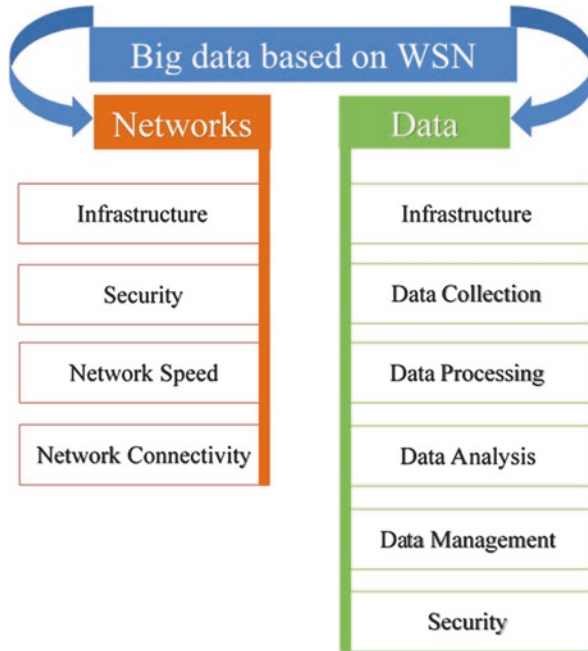
In a Smart House, there are infinite applications for the Internet of things. We can apply it on doors, so that if a friend or family member is waiting for you outside the house, you can easily unlock the door, because the key is connected to the internet. Also, you can apply it in the kitchen. There is a refrigerator that tells you

when a product is going to expire. Furthermore, it also has an internal camera that shows you the missing products so that you can get them while you are at the supermarket. One of our colleague once said: Maybe one day the refrigerator will come to me instead of me going to it. While that was said as a joke, who knows, maybe it will come true one day. Also, you can integrate the IoT in the bedrooms and so on [5].

A second example is Smart Vehicles. What we mean here is not vehicles that help you park or have a camera with some ultrasound sensors; rather, we are talking about driverless cars such as Teslas, Waymos, and future options. These cars are very useful for all people. The vehicles enable people to sleep, study, prepare for a meeting while traveling, or they can be used to transport children, elderly, or people who have difficulty driving such as blind people. It is also applicable to fix any issue related to it with just a software update. The new smart car now is called Tesla Model 3 that offers a double engine all-wheel drive, 20" Execution Haggles, and lowered suspension for aggregate control, in every single climate condition. What is more, a carbon fiber spoiler enhances security at high speeds, enabling the Model 3 to accelerate from 0 to 60 mph within 3.3 seconds [6].

3.2 Role of 5G Technology in the IoT and Big Data Analysis

The brisk development and improvement of 5G technology in the Internet of things, Cloud computing, software-defined networks, and big data analytics, has made dependable headway and formed a solid relationship between them. For instance, the IoT applications that generate information with enormous volume and smart speed require 5G, with attributes of high information rate and low laziness, to transmit such information quicker and more reasonably. Obviously, that information likewise needs the Cloud for processing and storage, and moreover, a software defined network to give a flexible structure framework to move this giant volume of information in an ideal manner. This topic investigates the associations among the improvement of the Internet of things, the Cloud, big data, and the software-defined networks in the coming 5G period, and we can perceive them as the five most valuable ICTs (information and trades progress) to watch for in 2020 in terms of their potential, blend, and applications. 5G improvement creative work has presently begun, and some 5G highlights or subsystems are already accessible. By embedding 5G compact broadband in the center, 5G will fill in as a predominant passage and transport sort out for IoT applications so that IoT data can be passed on even more profitably and monetarily [7]. Plus, IoT will end up one of the genuine wellsprings of big data by conveying a gigantic volume, at quick speed, and different assortments of information. The mass proportion of information being made by the IoT can change everything from collecting to therapeutic administrations to the plans and workings of sagacious urban regions—empowering them to work more gainfully and valuably than ever before.



3.3 The Smart City

A Smart City explores, experiments with, and uses technologies—such as the IoT—to improve its community [8]. The goal of Smart Cities is to build a sustainable and modern environment by applying IoT technologies to help the nation serve its population [9]. A Smart City has the same properties as the Modern City with some major adjustments as follows:

Smart Housing From its name, you may think we mean Smart homes, but that is not the case. Although it is a part of The Smart City, what concern us here in this chapter is how neighborhoods are designed, what services they have in case of emergency, and so on, which we will explain more in the IBM definition section [10].

Smart Security It has the same basics we explained before in The Modern City section; here, we are going to focus more on cyber security, as we are going to see in the IBM model, sensors and cameras are all over the place. There must be a strong system that safely stores all the private information. Also, the City runs on communication systems; therefore, the government must keep the online communication ready at all times. Additionally, security in general will be improved, because there will be cameras; we can not only film the criminal but also identify them. This is because of computer vision algorithms and methods and movement analysis technologies such as face detections.

Smart healthcare Healthcare is an integral part of any community, but in the Smart City, it is a bit different. A large number of sensors are connected in one web frame that can be accessed by the hospital facility and family members [11]. The hospital facility can use the data stored in the web to see the patient history, diseases, medication that the patient uses, and emergency contact. Also, family members can get notifications when the patient is in the hospital.



4 Impact of Smart Cities on Human Life

The United Nation organization has a great example of Smart Cities that they want to be different from all the cities around the world. As a result, they asked the UNECE and some of their partners to join them for this huge project. They will be focusing on mobility and sustainable houses, having clean energy, and achieving cities using the IoT [12].

The United Nation program of world Smart Cities created Sustainable Development Goals (SDGs) to know the exact level of performance compared to any city in any place. These SDGs are a piece of the programs. The main goals of it are wide, yet every one has a different rundown of focuses to accomplish.

4.1 Eliminate Poverty

Obliterating dejection in all world structures remains presumably the best feat defying humankind. Extensively, more than 800 million people are currently living on under \$1.25 every day; numerous requirements include adequate sustenance, clean drinking water, and sanitation. SDGs are resolved to end dejection in all circum-

stances and structures by concentrating on those living in defenseless conditions, extending access to basic resources and organizations, and reinforcing systems affected by hardship and climate related fiascos.

4.2 Eliminate Hunger

Hunger has been around forever, and we must fight it through the Smart Cities program that the United Nation created. To be able to eliminate this problem before it kills more people, we need to collaborate and to eliminate it from all the cities on the Earth. These are generally titanic achievements as lack of strong sustenance remains a huge issue in various nations. In 2014, 795 million individuals were surveyed to be interminably undernourished as a fast-delayed consequence of typical debasement, dry spells, and loss of biodiversity. More than 90 million children younger than five are hazardously underweight. Furthermore, one in four people in Africa are still hungry.

4.3 Responsible Consumption

Accomplishing money related progression and rational improvement necessitates that we drastically alter our impression of nature by changing the way we make and fund things and assets. Farming eats up a lot of water the world over. Regardless, the current water structure guarantees around 70% of all freshwater for human use. The valuable association of our ordinary trademark assets and the way wherein we discard poisonous waste and toxins are central focuses to accomplish this objective. Empowering attempts, affiliations, and buyers to reuse and decrease waste is similarly essential, as is supporting nations to move toward sensibly practical occurrences of utilization by 2030.

4.4 Gender Equality

Gender equality is not only a basic human right but also an essential foundation for a quiet, prosperous, and sensible world. Outfitting women and young women with proportionate access to preparation, restorative administrations, decent work, and depiction in political and money related essential initiative techniques will fuel doable economies and favorable social request positions, and humankind will be free to move around at will. We have seen astounding improvement starting now, and they should continue into the foreseeable future. Increasingly, young women are by and by in school in contrast from 15 years earlier, and most areas have accomplished gender equality with fundamental guidance.

4.5 Clean Drinking Water

Water deficiency impacts in excess of 40% of individuals in the world, an angering wonder that is predicted to increase with the ascending of temperatures, even though 2.1 billion individuals have gotten improved water sanitation since 1990. Decreasing supplies of safe drinking water are an important issue influencing each mainland.

4.6 Affordable Energy

Somewhere between 1990 and 2010, the number of individuals with access to power reached 1.7 billion, and as the population keeps rising, so will the excitement for a weather-beaten vitality. A general economy subject to oil subordinates, and the advancement of ozone-depleting substance discharges, is negating genuine upgrades to our air structure. This is affecting each territory. Starting in 2011, endeavors to significantly empower clean energy accomplished in excess of 20% of power being made by unlimited sources. Still, one out of seven individuals needs access to power, and as the interest keeps ascending, there should be a general increase in the amount of reasonable power sources throughout the world.

4.7 Building New Industries

Enthusiasm for structure and headway are basic drivers of money related advancement and improvement. Creative headway is the way to discover suffering responses for both financial and natural challenges. For instance, giving new occupations and propelling imperativeness capability. Advancing reasonable endeavors, and putting resources into clever research and progress, are unfathomably basic approaches to invigorate fiscal improvement.

4.8 Acts against Climate Change

There is no nation on the planet that is truly not encountering the remarkable impacts of change. Ozone-depleting substance floods continue to rise and are now 50% higher than their 1990 estimation. Also, a general temperature adjustment is rolling out alterations in our atmosphere structure, which relates to irreversible results if we do not make a move now. The yearly customary mishaps from waves, tropical storms, and flooding mean a couple of billions of dollars, requiring an undertaking

of US\$6 billion reliably in a calamity threat alone. The objective intends to gather \$100 billion reliably by 2020 to address the necessities of making nations prepared and help moderate condition related calamities.

4.9 Greater Life on Earth

Human life relies on the earth as much as the sea for our sustenance and occupations. Vegetation makes up 80% of our food source, and we depend upon horticulture as an essential cash related asset and methods for progress. Forests make up 30% of the world's surface, providing habitat for myriad animal varieties and pivotal hotspots for clean air and water; and they are basic for engaging normal change. Today, we are seeing unimaginable land debasement and the loss of 30% of arable land to different events at a veritable rate. The dry season and desertification are also on the rise every year, connoting the loss of 12 million hectares and affecting poor frameworks all around. Out of the 8300 creature breeds known, 8% are dying out and 22% are in danger of extinction.

4.10 Peace and Justice Around the World

Without concordance, soundness, human rights, and convincing organization, in perspective on the standard of law—we cannot look for viable progression. We are confronting a day by day reality with the end goal that is dynamically parceled. A couple of territories have acknowledged and proceeded with measurements of agreement and accomplishment, while others fall into plainly vast cycles of contention and savagery. This is in no way, shape or form, unavoidable and must be tended to. Anomalous measures of prepared violence and slightness ruinously influence a country's improvement, affecting money related advancement and normally achieving long-standing grumblings that can crop up for a very long time. Sexual severity, bad behavior, misuse, and torment are in like manner pervasive where there is a war or no standard of law, and nations must take measures to ensure the well-being of the general population who are most in peril.

5 The Critique on Smart Cities

Every scientific advancement has its drawbacks. Therefore, in our critique we hope to highlight the disadvantages to help guide future researchers and designers who are interested in the Smart City in their own research and models. First, the high level of complexity in the city, due to all the connected components of all embedded

systems and sensors, complicates the network and may cause a lot of damage to the city. How many workers are required to maintain the embedded systems and sensors? Also, there is the question of, what is the raw data going to be used for? Are we even able to process all this data in real time? Thus, alongside this complexity of network, we need a strong processing unit working all day and night to analyze the data collected from the embedded systems and sensors. The second thing is the storage units. All the unprocessed data and the processed ones need a place to be stored and also secure backups. Additionally, some of the collected data are private, such as your car movement and water usage. Some of this data may be used to benefit the city's database, someone can argue, but some of them, such as car movements are a huge breach of privacy [13].

Another problem in the IBM model for a Smart City is that in case of an extreme emergency, they base their solutions for saving the city on the existence of a nearby Smart City, which is difficult and expensive. Also, what guarantees that what affected the first Smart City would not affect the second Smart City? The problems highlighted above are very critical, in our opinion. We hope future researchers and designer solve them; in the next section we will present some solutions.

5.1 Solutions

The most critiqued point in the present model is the distribution of embedded systems and sensors; if we could find a method for an efficient distribution, we would save a lot of money from lower system maintenance and its original cost. Also, fewer embedded systems and sensors means less data to process and store, which also would save a lot of money [14]. Additionally, if we could develop some deep learning and machine learning algorithms, these algorithms would decrease the number of relevant data that the city uses, so we would have a small number of storage units compared to what is represented in the model above. Another problem is that the Smart City should be fully prepared in case of emergency. The Smart City must be able to stand on its own. We could achieve that by using high end robots; these robots can help the Smart City officials to decrease the human factor such as fighting natural disasters [15].

6 Conclusion

To conclude with, we trust that we gave you a decent look at the idea of the Smart City and how the fourth era of PC—The Internet of Things—is going to assume an enormous role in its advancement. We likewise accept that Smart Cities are the eventual fate of any up and coming human progress, and we trust this chapter helped or if nothing else enlivened somebody to illuminate and build up this idea.

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